AD-A140 084 RADIAC SURVEY INSTRUMENTATION(U) ARMY TEST AND EVALUATION COMMAND ABERDEEN PROVING GROUND MD 02 NOV 83 TOP-8-2-172 1/1

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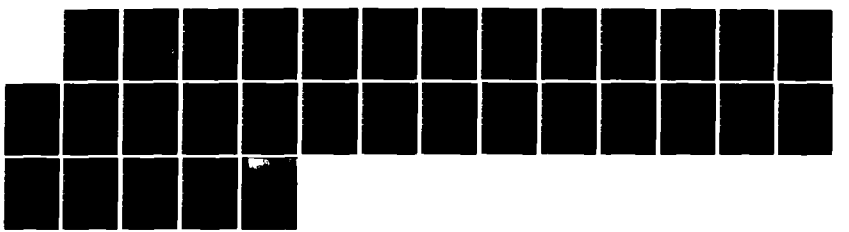

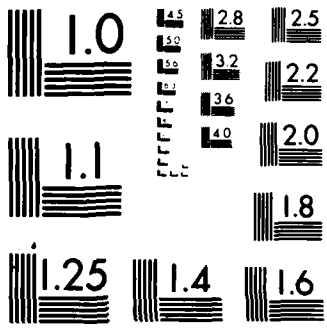

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Radiacmeters	Radiac Survey Instrumentation
Radioactive Source	Tactical Survey Meter
Radiation Dose Rates	Aerial Radiacmeter

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This test operations procedure (TOP) prescribes engineering test procedures to determine the technical performance of radiac survey instrumentation. Comparison of test results with technical specifications permits evaluation of their suitability for an intended end use.

Modern battlefield conditions have made it necessary that commanders have radiological information concerning contamination of occupied areas. (cont)

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Item 20 (cont)

Fall-out predictions provide some information; however, predictions must be confirmed by measurements. Radiacmeters have been developed to fulfill this measurement requirement.

This TOP is limited to tests outlined herein, which are applicable to radiacmeters designed for ground and aerial survey. This radiac survey instrumentation will be used by trained personnel of Alpha and Plucon teams. Applicable common engineering test TOP's are listed but not included.

The following tests will measure:

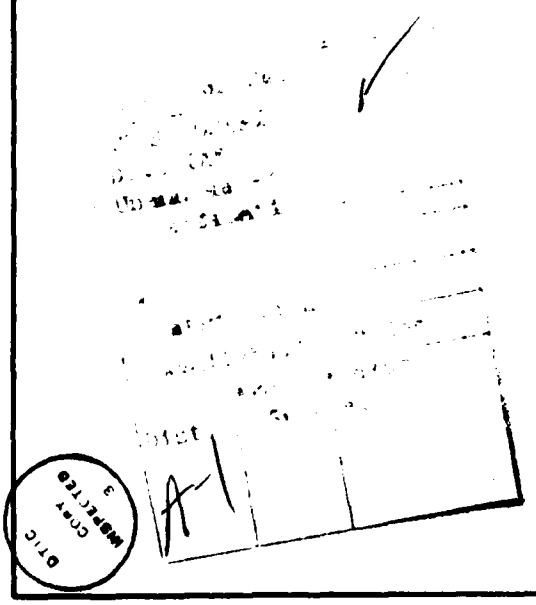
a. Directional Response - The objective of this subtest is to determine the response of the test item to radiation coming from different directions.

b. Accuracy - The objective of this subtest is to determine whether measurements of radiation can be made accurately and repeatedly.

c. Response Time - The objective of this subtest is to determine the ability of radiacmeter to respond to rapidly changing radiation dose rates.

d. Drift - The objective of this subtest is to determine the drift characteristics of the radiacmeter.

e. Warm-up Time - The objective of this subtest is to determine the warm-up time required before the instrumentation can accurately indicate radiation.



U.S. ARMY TEST AND EVALUATION COMMAND
TEST OPERATIONS PROCEDURE

DRSTE-RP-702-102
Test Operations Procedure 8-2-172*
AD No.

2 November 1983

RADIAC SURVEY INSTRUMENTATION

1.0 SCOPE

1.1 Objective

This Test Operations Procedure (TOP) delineates general test and specific subtest procedures for measuring and evaluating the technical performance and characteristics of Radiac Survey Instruments relative to criteria specified in the Required Operational Capability (ROC), Letter Requirements (LR), and Coordinated Test Program (CTP).

1.2 Limitations

This TOP considers radiological survey instruments. The large variety of such instruments to which this TOP is applicable preclude detailed coverage of any particular test item. Testing methods described are general to provide coverage for various radiological survey instruments and may be adapted to accommodate specific test items.

*This TOP supersedes MTP 8-2-172, 10 June 1969

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When radiological survey instruments are fitted to aircraft or ground vehicles, the host equipment will not be tested under the procedures outlined herein.

1.3 Common Engineering Tests

The following Common Engineering Tests applicable to these commodities are not included in this TOP:

a. 1-2-610 Human Factors Engineering

b. 6-2-504 Maintenance/Maintainability

c. 6-2-507 Safety and Health Evaluation - Communications/Electronic Equipment

d. MIL-STD-810C, Environmental Test Methods

2.0 FACILITIES AND INSTRUMENTATION

2.1 Facilities

a. Tests shall be performed at a facility with radiation measuring instrumentation capability. An X-ray facility shall be provided that will provide:

(1) X-ray dose-rates equal to approximately 1/4, 1/2, and 3/4 scale deflection at energies of approximately 10 to 250 kev.

(2) Filters to be used in conjunction with X-ray sources to control the output energy spectrum.

(3) Adjustment capability for required energy and dose-rate with the output checked by measurement instrumentation.

b. A radioactive source such as a radiac field calibration device shall be provided at the test facility.

2.2 Instrumentation

The following instrumentation is required to support this TOP:

a. Photographic support equipment

b. Calibrated dose-rate measurement instrumentation

c. Electronic measuring instruments - voltmeters, ohmeters, etc.

2.3 Characteristics/Requirements

The characteristics and accuracies of the above test instrumentation are determined by the performance specifications of the individual radiac device to be tested and the circuits in which it is to be used. Select test instrumentation having an accuracy of sufficiently higher accuracy (at least 3:1) than that of the test item. Calibration of all test instrumentation shall be traceable to the National Bureau of Standards. The above listed major facilities, instrumentation and equipment will provide the necessary characteristics and setups required to perform the subtests outlined by this TOP.

3.0 PREPARATION FOR TEST

a. Determine if a specific NRC license is required for use of the radioactive material. If a license is required, prepare and submit the application.

b. Review TECOM Pamphlet 70-3, Project Engineers' Handbook for guidance on test planning, execution, and reporting; and post-test activities.

c. Maintain a readily accessible project log and project file.

d. Review the local installation's Project Officer's Handbook, standing operating procedures (SOP) and implementing directives which govern the administrative processes of preparing test plans, conducting tests, preparing reports, reporting to the Test Resources Management System (TRMS) and budgeting.

e. Acquire and review all descriptive, instructional, and specification material on the test items issued by Government and contractor(s) for checking the test plans' subtest objectives, criteria, facility(ies) and instrumentation requirements.

f. Determine the scheduled availability of the test item.

g. Ensure availability of appropriate facilities, and coordinate the test support requirements including personnel, equipment, maintenance, spare parts and instrumentation.

h. Review the detailed test plan.

i. Record as a minimum the following data:

(1) Nomenclature, serial number(s), manufacturer's name, and function of the item(s) under test.

(2) Nomenclature, serial number, accuracy tolerance, calibration requirements, and last calibration date of test equipment selected for the tests.

(3) Damages to the test item(s) incurred during transit and any obvious manufacturing defects.

(4) Test item photographs.

j. Establish instrumentation or measurement system mean error and standard deviation of error.

k. Determine test item sample size.

4.0 TEST CONTROLS

a. Organize test team and establish responsibilities for test conduct, reporting, and data control.

b. Select test equipment having at least three times the accuracy of the item to be tested.

c. Familiarize all test personnel with the test item instructional material.

d. Prepare adequate safety precautions to provide safety for personnel and equipment and ensure all safety SOPs are observed throughout the test.

NOTES:
1. All radiological safety requirements in 10 CFR, AR 385-11, and AMCR 385-25 shall be complied with.
2. Test personnel working with radioactivity for the first time shall be informed of the radiation hazards associated with their work and their right to review radiation exposure records indicating their accumulated dose.
3. High voltage in some of these instruments requires cautious handling during maintenance to prevent shock. Many instruments, though switched to "OFF" position, still retain sufficient charge to create a shock hazard.
4. Following receipt, each radioactive source shall be leak tested in accordance with NRC and DA directives.

e. Inspect the test item thoroughly for obvious physical and electrical defects. Note and correct all defects before proceeding with testing.

5.0 PERFORMANCE TESTS

NOTES: 1. Modification of these procedures shall be made as required by design of the item under test and available test equipment. Such modifications shall not affect the validity of test results.

2. Certain tests included herein are applicable only when the test item is fitted with an external probe. A majority of test items will be of the tactical gamma survey type.

5.1 Test Methods

5.1.1 Directional Response

a. Expose the test item to radiation equal to the calibration level for the range in use. Insure that the proper operator safeguards are observed.

b. Rotate the test item about its three mutually perpendicular axes through the geometric center of the detector.

c. Investigate meter imbalance by tapping and observing meter indications as it is rotated about its axis. If the meter is unbalanced or sticky it should not be used. No radiation shall be applied during this portion of the test.

d. Repeat step 5.1.1 in 20° increments (or less if necessary) and expose to known dose rates at each angular position. Suitable clamping devices, and means to measure the angle accurately are required.

5.1.2 Accuracy

NOTE: It is not feasible to perform accurate measurements of radiation in the field. It is recommended that measurement of radiation be made under laboratory conditions from laboratory sources or standard calibrators.

5.1.2.1 Aerial Radiacmeter

a. Calibrate the instrument to be tested (test item). Measure parameters of internal test equipment of the test items, and go-no-go operations.

b. Obtain data under simulated altitude conditions. Measure each test item output to include ground dose-rate. The following guidelines are suggested:

(1) Simulated altitudes of 100 to 1000 feet.

(2) Dose-rates of .03 to 300 rads/hr applied to the detector.

(3) Terrain correction settings from 0-100, if applicable.

(4) Suitable combinations of these variables to produce ground dose-rates of 1 to 1000 rads/hr.

c. Measure appropriate test point voltages for each dose-rate, simulated altitude and terrain settings, and combinations of these parameters.

d. Check the operation of the event marker.

e. Determine the effects of changing the manual altitude control setting when the test item is operating in the radar altimeter mode.

f. Measure the range of the manual altitude setting when the test item is operating in the manual altitude mode.

5.1.2.2 Tactical Survey Meter and/or Vehicular Radiac System

a. Perform a pre-operational check on the test item in accordance with the operations manual. Calibrate the test item using appropriate radiac calibrator.

b. Radiate the test item at selected dose-rates, e.g. 1, 5, 10, 20, 50, 100, 200, 400, and 500 rads/hr. Note the reading on the meter scale of the test item for each level of radiation used.

c. When applicable, measure the output voltage at appropriate test item terminals. Measurements shall be made for each level of radiation used.

5.1.2.3 Reaction to Overload Dose-Rates

a. Subject the item under test to a complete calibration check.

b. Expose the test item to radiation overload rates as indicated in the specifications, or if not specified, to overload rates of at least 5 to 10 times the intensity required for full scale readings while observing the test item's indicator. Remove the radiation source while observing the test item's indicator.

c. Recheck the calibration of the test item, and compare with original calibration.

5.1.2.4 Alpha Probe Sensitivity

a. Fabricate a test fixture that will allow the probe test item to be precisely placed over a source/mask combination, so as to successively expose each portion of the probe to the same amount of radiation.

b. Determine the sensitivity of alpha probes as follows:

(1) Subject the radiacmeter test item to pre-operational test in accordance with applicable instruction manuals. Using available calibration sources, expose each test item to alpha radiation in the manner specified for calibration on each range.

(2) Remove detector cable from the test item and apply suitable pulses to the test item by using a pulse generator. Pulse rates corresponding to full scale deflection, and to each numbered division on each range of the test item shall be selected. Monitor the pulses using a counter to ensure that the correct pulse rate is being applied.

(3) Repeat steps (1) and (2) above for each test item with suitable masks (attenuators) placed between the calibration radiation source and the probe to obtain readings of approximately 1/4, 1/2 and 3/4 scale on each range. All test items shall then be exposed in turn.

(4) Determine the uniformity of response of each test probe face by sequentially exposing small areas of the probe to alpha radiation.

(5) Expose the test unit to alpha radiation of the amount used for calibration on each scale, and simultaneously expose the test unit to approximately 2 rads/hr of gamma radiation from Cesium 137 or Cobalt 60. If the test unit meter indicates above the highest scale marking, select a lower value of gamma radiation. Select lower values of gamma radiation until a readable value is obtained with and without applied gamma radiation.

(6) Repeat step (5) above, using X-radiation between 10 and 250 keV instead of high-energy gamma radiation.

(7) Repeat step (6) above using beta radiation from an AN/UDM-2 (Strontium 90, Yttrium 90) field calibrator, or other equivalent standard source instead of high-energy gamma radiation. The beta intensity shall be adjusted so that readable radiacmeter indications are obtained when beta radiation is applied alone and concurrently with alpha radiation.

(8) Subject the alpha probe test item to a light source such as bright sunlight or a 100-watt bulb 3 inches from the probe. Rotate and apply slight hand stress to the test item probe while exposing all parts of the probe to the light source.

5.1.2.5 Low Energy Gamma Probe Sensitivity

a. When conducting this subtest, the test item will be exposed to radiation using an approved X-ray facility, as follows:

(1) The facility shall be adjusted to provide dose-rates equal to approximately 1/4, 1/2, and 3/4 scale deflection at energies of approximately 17 to 60 keV.

(2) Filters shall be used in conjunction with the X-ray facility to control the output energy spectrum.

(3) The X-ray facility shall be adjusted for each required energy and dose-rate in turn, and the output checked using instrumentation. Each of the radiacmeters shall then be exposed using the low-energy gamma probe.

b. Determine the sensitivity of low-energy gamma probes as follows:

(1) Expose the instrument under test to low-energy X-ray radiation of the amount used for calibration on each scale and simultaneously expose the test item to gamma radiation from Cesium 137 or Cobalt 60. If the test item meter indicates above the highest scale, select a lower value of gamma radiation. Select lower values of gamma radiation until a readable value is obtained with and without the application of high-energy gamma radiation.

NOTE: The capability of the test item discriminator control to reduce the interference from the high-energy radiation while maintaining accuracy shall be determined at different intensities of gamma radiation.

(2) Repeat step (1) above using beta radiation from an AN/UDM-2 (Strontium 90, Yttrium 90) field calibrator or equivalent standard source. The beta intensity shall be adjusted so that readable test item indications are obtained when beta radiation is applied alone and concurrently with low-energy gamma radiation.

NOTE: The capability of the discriminator control to reduce the interference from beta radiation while maintaining accuracy of the low-energy gamma radiation reading shall be determined.

5.1.2.6 Geiger-Mueller Detector Sensitivity

a. Adjust the test item to operate using the Geiger-Mueller detector, and expose the instrument to radiation of the amount used for calibration on each scale while simultaneously exposing the instrument to gamma radiation from Cesium 137 and/or Cobalt 60 at selected dose-rates.

b. Expose the test item to gamma radiation between 10 and 250 keV at selected dose-rates while the internal Geiger-Mueller detector is being used.

5.1.2.7 Warning Device Sensitivity

a. Mount the test item on the laboratory instrument table of an AN/UDM-1 radiation source or equivalent, and conduct a performance check to ensure that the item is operating correctly.

b. Move the laboratory table to the end of a track most distant from the radiation source with the test item in operation. Adjust the test item to its most sensitive setting. Slowly pull the instrument table with the test item along the track toward the radiation source until the warning device is activated. Measure the distance between the test item and the radiation source and note the radiation rate at which the alarm is activated.

c. Repeat step (b) above for various sensitivity settings of the test item.

d. Repeat step (b) above for the visual warning device, if applicable.

e. Activate the alarm system of the test item and measure the drain on the power source when the alarm system is activated but untriggered.

5.1.3 Response Time

a. A test fixture shall be fabricated to provide rapid interposition and removal of a shielding plate between the calibration source and the probe of the test item. The shielding effect shall cause an order of magnitude difference (10:1) in radiacmeter indications.

b. Expose an alpha probe test item, with alpha probe attached, to radiation from calibration sources that provide at least one-half scale deflection. Measure the elapsed time between the original test item indication and the final indication after the shielding plate has been removed (or interposed). The time to reach 90 percent of the final meter indications shall be measured for both increasing and decreasing radiation. When sources are available which can provide the required dose-rates, all applicable ranges of the test item shall be used. Test methods shall be replicated more than three times with at least three different operators in order to minimize human reaction time errors.

c. Repeat step (b) above for each gamma probe test item while using the low-energy gamma probe.

d. Repeat step (b) above for the internal Geiger-Mueller detector of the test item and exposing the detector to one-half scale value of the gamma radiation from an AN/UDM-1 or equivalent calibrator.

5.1.4 Drift

a. Replace the test item batteries with an external power source. Connect a chart recorder or electronic counter internally to the test item to obtain an accurate measurement of the voltage counts per minute that would be normally read by the set.

NOTE: The external power source shall be capable of maintaining greater than minimum operating voltages during the prescribed drift test period.

b. Subject the test item to pre-calibration checkout in accordance with applicable procedures.

c. Fit the item under test with alpha probe, low-energy gamma probe and Geiger-Mueller detector, if so equipped, and radiate with appropriate radioactive sources. Operate continuously for 100 hours with ambient climatic conditions. Where applicable, the sources shall be firmly attached to the probes.

d. Recalibrate the test item (pre-calibration checkout) in accordance with applicable procedures.

5.1.5 Warm-up Time

a. Energize the test item and radiate with appropriate sources. When applicable, the sources shall be applied to the test item probe faces. De-energize the test item and allow to cool (unenergized longer than 15 minutes).

b. Switch on the test item and simultaneously start a stop watch. Stop the watch when the pointer of the test item has reached 95 percent of the reference reading.

c. Repeat test step (b) above at least three times for each test item. The test item shall be allowed to cool longer than 15 minutes between trials.

5.2 Data Required

5.2.1 Directional Response

a. Record the base radiation level when the test item is exposed to radiation equal to the calibration level for the range in use.

b. Record test item readings for each selected degree increment of rotation.

5.2.2 Accuracy

5.2.2.1 Aerial Radiacmeter

a. Record the results of pre-operational check and calibration of the test item. Record internal test parameters and results of go-no-go operations.

b. Record simulated altitudes, dose-rates and corresponding measurements of dose-rates. Record measurements that indicate equivalent ground dose-rates.

c. Record dose-rate, simulated altitude and terrain settings, and corresponding test point voltages.

d. Record the satisfactory/unsatisfactory operation of the event marker.

e. Record the effects of changing the manual altitude control setting when the test item is operating in the radar altimeter mode.

f. Record the range of the manual altitude setting when the test item is operating in the manual altitude mode.

5.2.2.2 Tactical Survey Meter and/or Vehicular Radiac System

a. Record the results of pre-operational check and calibration of th test item.

b. Record the following:

(1) Dose-rates to which the test item was subjected.

(2) Readings on the calibrated meter scale for each level of radiation used.

c. If applicable, record the voltage at the test item output termina for each level of radiation used.

5.2.2.3 Reaction to Overl. . l Dose-Rates

a. Record the results of the initial calibration check.

b. Record the overload radiation exposure rates and the test item indicator action during exposure and when the radiation source is removed.

c. Record the results of comparing initial and final calibration che

5.2.2.4 Alpha Probe Sensitivity

a. Record the results of pre-operational tests and alpha radiation ca bration for each range.

b. Record pulse rate that corresponds to full scale deflection for ea range of the test item.

c. Record the readings with suitable masks (attenuators) placed betw the source and probe.

d. Record the response of each probe face when small areas of the pr are exposed to alpha radiation.

e. Record the interference from the gamma radiation source. This is corded as a percentage of alpha radiation indicated as a function of inter- ference gamma radiation intensity. Record discriminator adjustments.

f. Record the interference from X-radiation source. This is recorde a percentage of alpha radiation indicated as a function of interference X-radiation intensity.

g. Record the interference from a beta radiation source. This is re- corded as a percentage of alpha radiation indicated as a function of inter- ference beta radiation intensity.

h. Narrate the results of exposing the alpha probe to light source and slight probe stress applied by hand.

5.2.2.5 Low-Energy Gamma Probe Sensitivity

a. Record the intensity of the low-energy X-ray radiation, the intensity of the simultaneously applied gamma radiation and the test item readings with and without the application of high-energy gamma radiation. Record data indicating the capability of the test item discriminator to reduce interference.

b. Record the intensity of the beta radiation, the intensity of the simultaneously applied low-energy gamma radiation and the test item readings with and without the application of beta radiation. Record data indicating the capability of the test item discriminator to reduce the interference.

c. Record the intensity of X-ray radiation, beta radiation, gamma radiation and test item readings with the alpha discriminator control adjusted for minimum sensitivity.

5.2.2.6 Geiger-Mueller Detector Sensitivity

a. Record the following for each test outlined by paragraph 5.1.6a and 5.1.6b.

(1) Radiation sources used.

(2) Applied energy levels and dose-rates.

(3) Test item indications.

5.2.2.7 Warning Device Sensitivity

a. Record the results of the performance check.

b. Record the magnitude of the radiation source and the distance between the radiation source and the test item when warning is activated.

c. Record the test item sensitivity setting.

d. Record the current drain on the power source when the alarm system is activated but untriggered.

5.2.3 Response Time

a. Record sources of radiation.

b. Record settling time - alpha probe.

Trial 1	Operator 1
Trial 2	Operator 2

c. Record settling (response) time - low-energy probe.

d. Record settling (response) time - internal Geiger-Mueller detector.

5.2.4 Drift

a. Record the results of pre-calibration checks.

b. Record the following:

(1) Date and time of each radiation reading.

(2) Meteorological conditions at time of each reading (temperature, humidity, pressure, etc.).

(3) Results of electronic counter readings.

(4) Description of power source.

(5) Equipment failures, if applicable.

c. Record the results of pre-calibration checks.

5.2.5 Warm-Up Time

a. Record the reference reading (after stabilization) when the test item is subjected to radiation from appropriate sources.

b. Record the following:

(1) Average time readings for each probe, if applicable, and range.

(2) Equipment failures, if applicable.

6.0 DATA REDUCTION AND PRESENTATION

6.1 General. Processing of raw test data, in general, includes but is not limited to the following steps:

a. Marking test data for identification and correlation according to subtest.

b. Organizing data into tabular and graphical form.

c. Modifying data to correct for nonstandard conditions.

d. Determining the statistical variation of the results in terms of the average value and standard deviation of the particular quantities and the correlation among two or more quantities.

NOTE: The test directive (or specification) itself serves to define the types and characteristics of the raw test data, and the ultimate objective of the test program defines the form of the test data desired.

6.2 Pre-Test Data. Data to be recorded prior to testing shall include, but not be limited to:

a. Nomenclature, serial number(s), manufacturer's name, and function of the test items.

b. Nomenclature, serial number(s), accuracy tolerances, calibration requirements, and last date calibrated of the test equipment selected for the tests.

c. Manufacturing defects and/or damages to the test item that were incurred during transit.

6.2.1 Additional Data

Data to be recorded, in addition to specific instructions listed below for each subtest, shall include:

a. An engineering logbook containing, in chronological order, remarks and observations which would aid in an analysis of the test data. This information may consist of temperatures, humidity, pressures, and other appropriate environmental data, or other description of equipment or components, and functions and deficiencies, as well as theoretical estimations, mathematical calculations, test conditions, intermittent or catastrophic failures, test parameters, etc. that were observed and obtained during the test.

b. A block diagram of the test setup employed in each specified test. The diagram shall identify by model and serial number all test equipment and interconnections (cable lengths, connectors, attenuators, etc.) and indicate control and dial settings where necessary.

c. Photographs or motion pictures (black and white or color), sketches, charts, graphs, or other pictorial or graphic presentations in support of test results and conclusions.

d. Test item sample size (number of measurement repetitions).

e. Test instrumentation or measurement system mean error or stated accuracy.

6.3 Subtest Data

6.3.1 Directional Response

Data will be analyzed to determine whether the attitude of the test item in relation to the direction of the radiation used has an effect on the radiation readings. Data will be presented in tabular form to show readings with each increment of rotation and indicated meter friction.

6.3.2 Accuracy

Data will be analyzed to determine:

a. Whether measurements of radiation can be made accurately and repeatedly.

b. The reaction of the radiacmeter to overload dose-rates of radiation.

c. Radiation probe sensitivity, if applicable.

d. The sensitivity of warning devices, if present.

Data will be presented in tabular form. It may be augmented by other forms such as polar plots of directional response.

6.3.3 Response Time

Data will be analyzed to determine the ability of the radiacmeter to respond to rapidly changing radiation. Data will be presented in tabular form.

6.3.4 Drift

Data will be analyzed to determine the drift of the radiacmeter during a prescribed operating time. Data will be presented in tabular form.

6.3.5 Warm-Up

Data will be analyzed to determine the warm-up time required before the radiacmeter can accurately indicate radiation. Data will be presented in tabular form.

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APPENDIX A
CHECKLISTS

A.1 PRETEST

a. Detailed test procedure available _____

b. Instrumentation support facility available _____

b.1 Instrumentation calibrated _____

c. Engineering logbook available _____

c.1 Logbook entries of date, test conductor _____

d. Safety precautions instituted _____

e. Test personnel informed of review rights _____

f. Sample plan prepared _____

A.2 PERFORMANCE TEST

Detailed test procedure available _____

A.2.1 Directional Response

a. Measurement of response at 20 degree intervals _____

b. Investigation of imbalance _____

A.2.2 Accuracy

a. Aerial Radiacmeter accuracy _____

b. Tactical Survey/Vehicular Systems accuracy _____

c. Overload dose-rate effects _____

d. Alpha Probe sensitivity _____

e. Low-Energy Gamma Probe sensitivity _____

f. Geiger-Mueller Detector sensitivity _____

g. Warning Device sensitivity _____

A.2.3 Response Time

a. Test fixture available _____

b. Time measuring device available _____

c. Several test operators used _____

A.2.4 Drift

a. External power source available _____

b. Chart recorder or counter available _____

c. Radiation sources available _____

d. Probes appropriately radiated _____

A.2.5 Warm-Up Time

a. Stop watch available _____

b. Measurements repeated _____

APPENDIX B
DATA COLLECTION SHEETS

B.1 Directional Response

Test Procedure: _____ Date: _____

Test Director: _____ Test Conductor: _____

Test Item SN: _____

Dose-Rate Standard: _____

Angle	Axis 1 Dose-Rate	Axis 2 Dose-Rate	Axis 3 Dose-Rate
0			
20			
40			
60			
80			
100			
120			
140			
160			
180			
200			
220			
240			
260			
280			
300			
320			

340 _____ _____ _____

360 _____ _____ _____

Meter Unbalance (Narrative) _____

B.2 Accuracy

B.2.1 Aerial Radiacmeter

Test Item SN: _____

Radiation Standard: _____

Simulated Altitude	Dose-Rate	Test Item Reading
100 (feet)	_____	_____
200	_____	_____
400	_____	_____
800	_____	_____
1000	_____	_____

Simulated Altitude	Dose-Rate	Test Item Voltage
100	_____	_____
200	_____	_____
400	_____	_____
800	_____	_____
1000	_____	_____

Manual Altitude Control Effects (Narrative) _____

Range of Manual Altitude Setting: _____ to _____

B.2.2 Tactical Survey Meter/Vehicular Radiac System

Test Item SN: _____

Dose-Rates	Test Item Reading	Voltage
1 (rad/hr)	_____	_____
5	_____	_____
10	_____	_____
20	_____	_____
50	_____	_____
100	_____	_____
200	_____	_____
400	_____	_____
500	_____	_____

B.2.3 Reaction to Overload Dose-Rates

Test Item SN: _____

Radiation Standard: _____

Overload Exposure	Test Item Reaction
5X	_____
7X	_____
10X	_____

B.2.4 Alpha Probe Sensitivity

Test Item SN: _____

Test Fixture SN: _____

Exposure Rate (Alpha)	Test Item Reading
_____	_____
_____	_____
_____	_____

Gamma Radiation Source _____

Exposure Rate (Alpha)	Test Item Reading
_____	_____
_____	_____
_____	_____

X-Ray Radiation Source _____

Exposure Rate (Alpha)	Test Item Reading
_____	_____
_____	_____
_____	_____

Beta Radiation Source _____

Exposure Rate (Alpha)	Test Item Reading
_____	_____
_____	_____
_____	_____

Response to Light (Narrative) _____

B.2.5 Low-Energy Gamma

Test Item SN: _____

X-Ray Facility ID: _____

Field Calibration SN: _____

X-Radiation Rate: _____

Gamma Radiation	Test Item Reading
_____	_____
_____	_____
_____	_____

Beta Radiation _____

Gamma Radiation	Test Item Reading

Gamma Radiation _____

Beta Radiation _____

X-Radiation _____

Discriminator Adjustment	Test Item Reading

B.2.6 Geiger-Mueller Detector Sensitivity

Test Item SN: _____

Gamma Radiation	Test Item Reading

B.2.7 Warning Device Sensitivity

Test Item SN: _____

Radiation Source SN: _____

Trial	Alarm Distance	Visual Alarm Distance
1		
2		
3		
4		

Power Supply Drain _____

B.3 Response Time

Test Item SN: _____

Test Fixture SN: _____

Radiation Source: _____

Alpha Probe Response	____	____	____	____
Gamma Probe Response	____	____	____	____
Geiger-Mueller Response	____	____	____	____

B.4 Drift

Test Item SN: _____

External Power Source: _____

Radiation Source: _____

Time (Hours)	Meter Reading
0	_____
8	_____
16	_____
32	_____
64	_____
100	_____

B.5 Warm-Up Time

Test Item SN: _____

Radiation Source: _____

Stop Watch SN: _____

Trial	Time
1	____
2	____
3	____
4	____

APPENDIX C
REFERENCES

1.	TECOM Pam 310-4	Index of Test Operations Procedures
2.	TECOM Pam 70-3	Project Engineers' Handbook
3.	TECOM Reg 70-24	Documenting TECOM Testing
4.	Title 10 - Chapter 1	Code of Federal Regulations
5.	AR 385-11	Safety, Ionizing Radiation Protection
6.	AMCR 385-25	Safety, Radiation Protection
7.	TOP 1-2-610	Human Factors Engineering
8.	TOP 6-2-504	Maintenance/Maintainability
9.	TOP 6-2-507	Safety and Health Evaluation-Communication Electronic Equipment
10.	TOP 3-1-002	Confidence Intervals and Sample Size
11.	TB 11-6665-227-12	Safe Handling, Storage and Transportation of Calibrator Set, Radiac AN/UDM-2
12.	TM 11-6665-227-12	Operator's and Organizational Maintenance Manual Calibration Set, Radiac AN/UDM-2

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APPENDIX D
ABBREVIATION

CTP	Coordinated Test Program
LR	Letter Requirement
ROC	Required Operational Capability
CFR	Code of Federal Regulations
AMCR	Army Materiel Command (DARCOM) Regulations
DARCOM	US Army Materiel Development and Readiness Command
NRC	Nuclear Regulatory Commission
UDM	U - General Utility, D - Radiac, M - Maintenance/Test
MTP	Materiel Test Procedure
TOP	Test Operations Procedure

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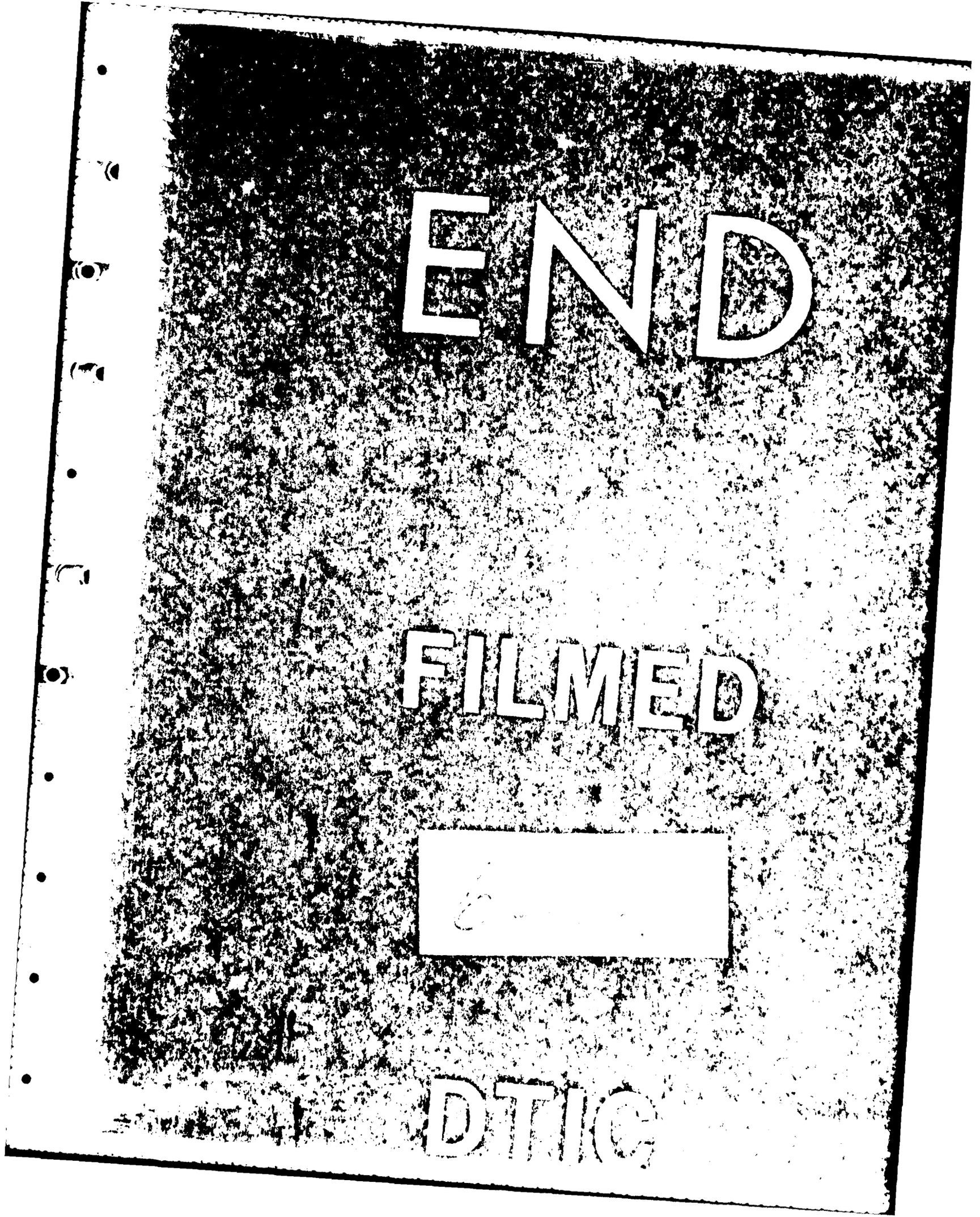
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